

1.1 Eradicating Crack Willow and Grey Willow

1.1.1 The Issue

Crack willow (*Salix fragilis*) and grey willow (*Salix cinerea*) are common environmental weeds along streams and in damp places. Both species tolerate a range of environmental conditions including flooding, hot to cold temperatures, a range of soils, and semi-shade.

Crack willows can form vast stands along stream channels and displace many species important to riparian communities. The dense roots of the trees can also cause stream blockages, flooding and structural changes in waterways. The trees spread by branch and stem fragments which break from the parent tree. The trees also have suckering roots meaning that branches can grow up from buried stems and roots. Cut stems re-sprout. Most crack willow trees are male meaning that they do not usually produce viable seed, although they can hybridise easily with other willow species such as weeping and silver willow (Thompson and Reeves, 1994).

Grey willows occur along streams and damp places where they can form dense thickets. The trees grow rapidly meaning that they out-compete native wetland and riparian species important to those communities. The trees produce copious wind blown seed that spread widely. The trees also spread by suckering roots. Cut stems re-sprout.



Crack willow



Grey willow

Photos: ARC

1.1.2 Decision Making Process

- What species of willow is present? Is it an invasive weed?
- What function are the tree(s) currently performing? (5 roles of Green Network.) e.g. bank stabilisation; stream shade; weed suppression; amenity; screening.
- What problems are the trees creating? e.g. stems spreading downstream; flooding; suppression of native species
- How can the willows be controlled while minimising the loss of existing benefits (i.e. riparian functions) that the trees are performing?
- What other management actions are needed to encourage a self maintaining, self adapting, self regenerating ecosystem?

Minimum loss – Willow trees can provide stream shade; canopy closure (which helps to suppress weeds); erosion control of stream banks; roots for bats etc.

Maximum gain – Prevent further spread of invasive willow species or invasion of other weed species; increase native biodiversity and resilience of native communities along the stream.

SOURCE:

Hall, K.L. (2008) *The Waitakere Best Practice Guidelines for Bush and Riparian Restoration*, draft report for Waitakere City Council, 19 September 2008.

1.1.3 Best Practice

Replacement Planting

Prior to willow control or removal of willow canopies native plants should be established to replace the willow. The plants chosen will depend on the habitat at the site and the ecological function (if any) that the willows were performing. If the willows are providing bank support, replace each willow with two kahikatea (*Dacrycarpus dacrydioides*) and three cabbage trees (*Cordyline australis*). If further up the bank providing shade, weed suppression and possible bat habitat, replace with large trees such as rimu (*Dacrydium cupressinum*), miro (*Prumnopitys ferrugineus*), matai (*P. taxifolia*), tariare (*Beilshmedia tarairi*), tanekaha (*Phyllocladus trichomanoides*), etc. On dry ridges, kauri trees (*Agathis australis*) are suitable bat habitat (O'Donnell, 2001).

Replacement planting should ideally be conducted 6 months to 5 years before the willow canopy is removed. At latest, establish trees at the time of poisoning. This is because once dead, the habitat beneath the willows will change. For example, larger later succession trees are suited to the low light conditions beneath willow, but will struggle to establish in high light conditions once the trees are dead. Higher light levels also promote weed growth.

Timing

Conduct control when willow are in full leaf (generally November to February). Control outside of these times will be ineffective as the trees are deciduous and have no running sap to absorb the poison.

Control Methods

1) Drill and Inject

Injection is the best method of herbicide application for willows (Ray, 1994) as it:

- kills the tree in situ – limiting disturbance and the spread of live twigs
- retains shade – reduces water temps., limits weed invasion and algae growth
- retains habitat – roosts for birds and bats, food for invertebrates
- restricts chemical exposure to only the target plant.

This method is suitable for both crack and grey willows with branches of greater than 50mm diameter. Two people are generally required, one to drill holes, the other to immediately inject the poison. Use a drenching gun set to 10ml dosage.

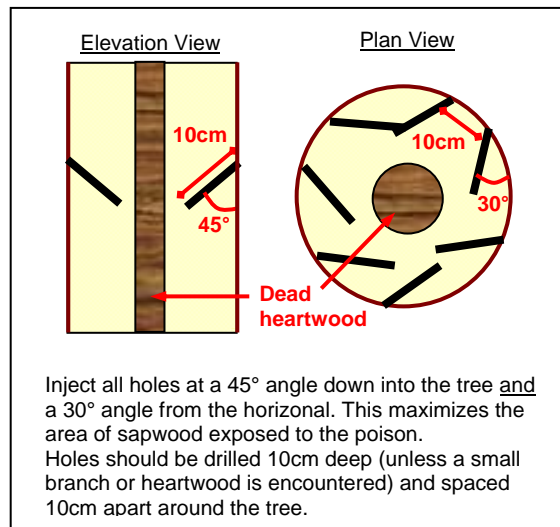
Location: Drill holes as close as possible to the ground or water level. Repeat every 10cm to form a ring of holes around the base of the tree. Repeat wherever a branch rises again after touching the ground or water. For small trees drill in a spiral pattern up the tree to avoid breaking the stem.

Drill depth: The poison needs to be absorbed into the sapwood of the tree. Drill until the hole is 10cm deep or before the colour of the drillings begins to darken, indicating the end of the sapwood. The darker heartwood is dead and sometimes hollow, and cannot absorb poison. Younger willows are almost all sapwood, so stop drilling before the bit passes right through the stem.

Drill angle: Drill down on an angle of 45° from the horizontal and 30° from the vertical (see diagram) to maximise contact with the sapwood.

Hole size: 15mm diameter

Herbicide: 10g Escort® + 1L glyphosate 20mL Pulse® penetrant + 1ml Landmark® dye per 2L water.



Dissolve the Escort into the water before adding the other chemicals. Always use clean water. Makes 3L herbicide (approx. 300 trees). Use 10ml herbicide mixture per hole within one minute of drilling.

For trees that are difficult to access, drill as many holes as possible. Alternatively use a larger drill bit (18mm) with more herbicide per hole (15ml).

2) Frill and Paint or Ring Bark and Paint

This method is suitable for both species. It is particularly suited to smaller trees or where a drill is unavailable. This method potentially uses more herbicide than drilling and injecting.

Frilling involves cutting through the bark with an axe to reach the sapwood. Cut around the whole circumference of the trunk, then pour herbicide into the cut that has been created.

Ring barking involves cutting a strip of bark at least 15cm wide from around the trunk of the tree. Cut down to the sapwood then paint this area liberally with herbicide.

Use the herbicide mixture as per drilling and injecting.

3) Foliar Spray with Glyphosate Herbicide

This method is suitable for both species. Foliar spraying potentially uses more herbicide than the previous methods. It is less suitable for areas where adjacent native vegetation may be affected by spray drift.

Use for seedlings and small trees and branches (<50mm diameter and <2m height). Herbicide should dampen all green foliage, but does not absorb into bark.

Herbicide: 10L water + 100ml glyphosate + 10ml Pulse[®] penetrant + 1ml Landmark[®] marker dye.

4) Cut and Paste with Herbicide

This method is most suitable grey willow. It is less suitable for crack willow unless all cut stems and fragments are removed off site to prevent them from sprouting.

Use for small trees and branches (<50mm diameter and greater than 2m in height) where drilling and injecting, frilling, ring-barking or spraying is impractical.

Use the same herbicide concentration as for drilling and injecting. Cut the tree at ground level and paint the stump immediately.

Removal of Standing Dead Willows

Where possible, leave the willow trees and branches standing. Even when dead, the trees continue to provide some shade, wildlife habitat, and bank holding function. Where trees overhang paths or pose a hazard to stormwater (e.g. flooding), some branches may need to be removed. Once dead, remove branches with a chainsaw and leave to rot on site. (Do not remove live branches as these will re-sprout.)

Notes

- The herbicide mixtures recommended above have been used successfully by Waitakere City Council for willow control.
- Additional information was provided by Cook (1999), Greenwood (1994), Hunt (1994) and Ray (1994).
- Both Escort and glyphosate are degraded by dirty water so ensure that clean water is used to mix herbicides.
- If there are a large number of trees growing together, stage the willow control. Remove every second or third tree over a period of 5-10 years. This will retain functions and provide additional time for replacement native plants to establish.
- For crack willow, work from the top of the catchment downstream in order to ensure that eradicated areas do not get re-infested from upstream.
- Willow root systems are highly effective at bank holding. Native trees can take longer to establish and have shallower roots. Additional engineering solutions may be required in high erosion areas.